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E-HEALTH: EVALUATION OF THE IMPLEMENTATION OF THE PERSONAL ELECTRONIC HEALTH RECORD BY FAMILY DOCTORS IN GREECE

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Keywords: *E-Health, personal electronic health record, questionnaire, assessment, family doctor, general practitioner.*

Introduction. *E-health (eH) is a basic component of current health care provision. The cornerstone of eH is the electronic health record (EHR) system.*
Material and methods. *The purpose of this survey is to assess the Greek EHR application by Greek family doctors, taking into consideration the brief period of EHR implementation in Greece. We adapted a preexisting questionnaire, with permission, translating and standardizing it in Greek. The questionnaire focused on computer use capability, EHR usage, and efficiency in daily clinical practice, user satisfaction and global user evaluation of the application. 175 family doctors filled out the questionnaire in February 2019.*
Results. *Low usage rates, minimal facilitation in daily practice, competency issues, and moderate user satisfaction were among our findings.*
Conclusions. *Greek EHR has several problems and inadequacy areas. Reversing these problems and optimizing the application, then reevaluating the results after a wider period of implementation is important.*

Cuvinte cheie: *E-Health, fișă electronică personală de sănătate, chestionar, evaluare, medic de familie, medic generalist.*

E-SĂNĂTATE: EVALUAREA IMPLEMENTĂRII CĂRȚII PERSONALE ELECTRONICE DE SĂNĂTATE DE CĂTRE MEDICII DE FAMILIE DIN GRECIA

Introducere. *E-sănătatea (eH) este o componentă de bază a furnizării actuale de asistență medicală. Piatra de temelie a E-sănătății este sistemul electronic de evidență medicală.*
Material și metode. *Scopul acestui studiu este de a evalua aplicarea sistemului electronic de evidență medicală de către medicii de familie greci, condiționați fiind de perioada scurtă de implementare a sistemul electronic în Grecia. Astfel, a fost adaptat, cu permisiune, un chestionar preexistent, care a fost tradus și standardizat în limba greacă. Chestionarul s-a axat pe capacitatea de utilizare a computerului, utilizarea sistemul electronic de evidență medicală, eficiența în practica clinică zilnică, satisfacția utilizatorilor și evaluarea globală a aplicației. Chestionarul a fost completat de 175 de medici de familie, pe parcursul lunii februarie, 2019.*
Rezultate. *În urma aplicării chestionarului s-au evidențiat următoarele aspecte: rate scăzute de utilizare, facilitarea minimă în practica zilnică, probleme de competență și satisfacția moderată a utilizatorilor.*
Concluzii. *Sistemul electronic de evidență medicală din Grecia prezintă multe probleme și deficiențe în anumite domenii. Este importantă analiza acestor carențe și optimizarea aplicației, apoi o ulterioară reevaluare a rezultatelor, după o perioadă mai lungă de implementare.*

INTRODUCTION

E-health (eH) is a key pillar in the planning and implementation of programs in the Health Care Sector – a rapidly developing component of health care in the 21st century (1). It encompasses the transfer of resources and health-related information to both healthcare professionals and consumers via the Internet and Telecommunications, and it is related to healthcare services, patient care, education, and research (2).

In 2004, the European Union sent to its Member States an action plan regarding E-health (the EU eHealth Action Plan) (3), identifying specific interventions and most importantly those that concerned with the implementation and operation of the electronic health record (4, 5). The Action Plan was updated in 2012, based on the new advances in electronic health (eHealth Action Plan (2012-2020 – Innovative healthcare for the 21st century) (6).

eH has multiple benefits including the optimized organization and coordination ofpatient care, improved quality of health for both individuals and population, as well as a more efficient operation of the administrative work (7). A multitude of services and tools are utilized in eH, and especially the electronic health records, e-prescription, (8) electronic referral systems (9), information exchange systems (10), telemedicine services and personal health records. Among them, the Electronic Health Record (EHR) is regarded as the most basic tools. The EHR is defined as the ensemble of recorded data regarding citizens' demographic data and health. It aims to record and monitor citizens' health over time and thus indirectly improve the quality of provided healthcare services (11). It includes a set of healthcare information parameters (such as habits and addictions, prevention programs, etc.) that go beyond the disease and the healing process per se. It is considered to be the epicenter of clinical information systems and provides a service and information resource that is complete, continuous, integrated, electronic, secure and accessible to authorized users (12).

The development and implementation of the EHR has been a strategic goal for the Greek National Healthcare System (NHS) for many years. However, systemic deficiencies (lack of relevant infrastructure, lack of a computer culture and lack of flexibility to keep an electronic or hand written file) have delayed the whole project. Several isolated attempts have been made to create and operate electronic filing systems, but these have been characterized as fragmented and spatially limited (13). The most significant of these efforts was the EPIRUS-Net system and the HYGEIAnet system (14, 15). Meanwhile, secure telecommunications networks were developed in both Primary Healthcare network and in the hospitals, named "SYZEFXIS" and "IASIS" respectively, which allowed the interconnection of units and the provision of medical and insurance services to all health regions (16).

In 2017, the Greek NHS ran a pilot phase of the EHR, which was introduced in its normal phase in spring, 2018 and now operates within a national network. The EHR application is accessible to all certified and authorized physician-users of the e-prescription system. The EHR and all other electronic applications for the NHS are described in detail within the Greek Law 4486/2017 on Primary Health Care. More specifically, it mentions the purpose, content, operation by the family doctor, safety, and data storage, as well as accessibility and consensus regarding the EHR.

Implementation of this project is a challenge for the Greek health care system per se as well as for its employees, and it needs to be reevaluated over time in order to identify the problem areas, as well as to propose interventions to be implemented towards the ultimate goal of improving the healthcare services, provided at all levels (prevention, treatment and rehabilitation).

In Greece, the EHR is a new tool for Family Doctors and Primary Care Physicians and there are no studies that evaluate its function and usability. This study, despite the restrictions imposed by the brief period of EHR use, aims to assess the use of the EHR application by family doctors, and at the same time identify potential problems and obstacles to be overcome to improve its functionality.

The purpose of the study: to identify the range of use of the EHR application as well ashow it facilitates various aspects of physicians' work. Moreover, the study was aimed at investigating the doctors' satisfaction regarding its functionality and usability.

MATERIAL AND METHODS

For the purposes of our research, we adapted and translated a preexisting PEHR assessment questionnaire that was developed and used in Norway, with the permission of its authors ("Evaluation of electronic medical records", Hallvard Lærum and Arild Faxvaag, BMC Medical Informatics and Decision Making, 2004) (17). The translation process of the questionnaire consisted of three phases and was conducted according to international translation procedures and criteria (18, 19, 20), while minor changes were made to the original questionnaire regarding its adaptation.

In the first phase, two healthcare professionals that were Greek native speakers with certified English proficiency carried out independent translations of the questionnaire in Greek. Subsequently, in the second phase, the two independent translations were synthesized in a questionnaire, via a consensus decision by a group of experts. Regarding adaptation, the final questionnaire had minor changes to the original – the main ones being its adaptation for Primary Health Care, and the fact that the emphasis was put on citizens-system users rather than patients. In the third and final phase of the translation, a reverse translation of the final adapted questionnaire was performed in English by a bilingual native English speaker, who was also an English tutor and has been living in Greece for over 20 years. The reverse translation questionnaire was compared to the original one by a group of experts that found no significant difference among them except for the parts that were adapted.

The final questionnaire includes 73 close-ended questions, being divided in five parts depending on content. The first part consists of the demographic characteristics of the participants. The second part consists of 24 questions concerning the frequency of use of the PEHR application by doctors for various medical issues. The third part includes the same questions as the previous section, the focus being on physicians' opinions about the extent to which the EHR has changed the processes involved. In the fourth part, the physicians are asked about their satisfaction with the EHRcontent, accuracy of the system, the ease of its use and whether the information is provided in a timely manner. The focus of the fifth and final part of the questionnaire is the overall satisfaction of physicians with the EHR. The process was completed by analyzing and assessing the reliability of the questionnaire, which turned out to be very high, as all Cronbach-*α* coefficients were greater than 0.8 and almost all exceeded the value of 0.9 (tab. 1).

Table 1. Cronbach's index for the questionnaire fields.

Field	Elements	alpha
Frequency and Usability	Referral and Results	0.972
	Seek Information	0.962
	Proceedings	0.801
Facilitation in Use	Seek Information	0.959
	Referral and Results	0.953
	Proceedings	0.870
Usage Satisfaction	Content	0.937
	Accuracy	0.926
	Convenience	0.951
	Timeliness	0.930

To meet the research objectives and obtain answers to the research questions, the questionnaire was shared with Family Physicians across the country, working in the Greek NHS. Family Physicians appointed by the Ministry of Health and working in the NHS were the only ones included in this research sample, since they are the only ones who have full access to the EHR for their registered citizens. Family Pediatricians working in the NHS were excluded from the sample due to their very small number.

Our questionnaire was distributed in printed form to the NHS Family Physicians of the Region of Pieria and in electronic form (via Google

Forms) to Family Physicians all over Greece working in the NHS. The link for the Google Forms distributed via e-mail and in all Greek Primary Health Care Physician networks on social media. All e-mail addresses were obtained from the Primary Health Care Units database of the 3rd Healthcare Region with permission.

Altogether, 310 questionnaires were sent for completion. A significant limitation of our study is our sample. Our final sample involved 175 doctors across Greece in February 2019, viz. (56%) – 91 men (52%) and 84 women (48%) participated in the survey. The overwhelming majority included General Practitioners (162 people), the others were internists and non-specialists. Almost half of respondents work in Primary Health Care Posts and Primary Health Care Centers (82 persons), (35.4%) in Public Primary Health Care Centers and the rest in TOMY (Local Health Units). The statistical analysis was carried out via the SPSS statistical package 23.

The total number of eligible physicians at the time of the study was under 2000 as reported by the Ministry of Health. Our final sample of 175 is small, but we consider our sample to be representative regarding the actual EHR physician use at the time, since the application is a relatively new optional tool and many physicians were not even aware of its existence and operation.

RESULTS

The Greek doctors involved in the study did not report using the EHR often for any of the activities described in the questionnaire. Patient referral, test results, patient information and bureaucratic procedures, are the procedures that were not widely applied through the EHR. The low application of the EHR for various procedures related to test results and patient information was linked to the doctors' view that NHS does not particularly facilitate the performance of these procedures. In addition, doctors have shown moderate satisfaction with the EHR content and the accuracy of the information it provides. Ease of use is another issue that concerns the participating doctors, and they have a negative view about the EHR regarding this aspect.

Gender, age, and specialty did not appear to have a significant effect on physicians' responses to the frequency of HER use, their views on the facilitation of various procedures, the self-reported satisfaction from the use of the new system, and their global assessment of the EHR.

The physicians' status and the time that passed from acquiring the specialty, however, appear to have a significant impact on the doctors' frequency of use of the EHR, their views on the facilitation it provides regarding the handling of various tasks, and the overall user satisfaction.

Finally, the percentage of citizens registered with a doctor in which the EHR is actually used, is the only factor that has a statistically significant impact on almost all research factors regarding the use of EHR (tab. 2).

In each case of procedures done through the EHR, it was found that most physicians who use EHR for this specific task are also those who believe that work is facilitated by the use of the EHR the most (tab. 3).

Finally, the perceived ease of use of the computer seems to have a significant impact on the doctor's reported frequency of use of the EHR and on their views regarding the facilitation offered in specific procedures (tab. 4).

In addition, doctors who reported greater overall satisfaction from the EHR are also those who considered the quality of their work to be improved via the use of EHR the most (tab. 5).

DISCUSSIONS

The next step in this research would be to repeat it and verify whether doctors' attitudes have changed, since the EHR is an innovative application yet. In addition, qualitative research should be conducted to investigate the doctors' opinions regarding the causes of the ineffectiveness of the EHR in depth, as well as their suggestions for its improvement.

While making the use of EHR mandatory would spread its use, we believe it is more important in this phase to optimize the system performance, functionality and integration based on the needs of its users. We also believe that making the EHR accessible to all Primary Health Care providers would partially ease the burden that falls on the NHS Physicians. Of note, the printed health booklets have recently been abolished, but the use of the EHR has not yet become compulsory, which potentially leads to information gaps in relation to citizens' health (24).

Table 2. Results according to the percentage of registered citizens and usage of EHR.

Factors/Questions	Value	p*
Frequency usage of EHR		
Reference and Results	10.276	0.006
Seeking information about patients	42.261	0.000
Bureaucracy affairs	14.792	0.001
Performance of clinical tasks		
Seeking information about patients	5.936	0.051
Reference and seeking information	0.709	0.701
Bureaucracy affairs	22.198	0.000
Satisfaction		
Content	17.434	0.000
Accuracy	19.282	0.000
Ease of use	17.433	0.000
Timeliness	24.307	0.000
Global assessment of EHR		
EHR is worth the time and effort required to use it	11.815	0.003
How would you rate your satisfaction with EHR	24.855	0.000
The performance of the department's work has become...[1]	18.459	0.000
The performance of my own tasks has become...[1]	18.746	0.000
The quality of the department's work has become...[1]	18.791	0.000
How would you rate the success of the EHR	18.466	0.000

*$p<0.05$

[1] Easy/Difficult

Table 3. Results according to usage frequency and the performance of clinical work tasks when using the EHR.

Statement	r	p*
Review the citizens' medical problems	0.361	0.000
Seek out specific information from citizens' records	0.494	0.000
Follow the results of a particular clinical examination or investigation over time	0.417	0.000
Obtain the results from clinical examination or investigation	0.328	0.001
Enter daily notes	0.389	0.000
Obtain information non investigation or treatment procedures	0.364	0.000
Check and enter information about daily habits	0.477	0.000
Produce data reviews for specific patient groups, e.g., complication rate, diagnoses	0.231	0.026
Order laboratory analyses	0.400	0.001
Obtain the results from laboratory analyses	0.333	0.011
Order X-ray, ultrasound, or CT investigations	0.248	0.043
Obtain the results of X-ray, ultrasound, or CT investigations	0.097	0.489
Order other supplementary investigations	0.158	0.199
Obtain the results from other supplementary investigations	0.128	0.338
Refer the patient to other departments or specialists	0.326	0.001
Check and enter immunizations	0.357	0.000
Write prescriptions	-0.116	0.249
Write sick-leave notes	0.212	0.046
Collect patient information for various medical declarations	0.303	0.001
Give written individual information to patients, e.g. about medications, disease status	0.426	0.000
Give written general medical information to patients	0.441	0.000
Collect patient info for discharge reports	0.492	0.000
Check and sign typed dictations	0.128	0.337
Register codes for diagnosis or performed procedures	0.385	0.000

*$p<0.05$

Table 4. Correlation between EHR usage frequency, performance of clinical work tasks and competence when using EHR on their PC or online.

	Co	UF_1	UF_2	UF_3	CP_1	CP_2	CP_3
Co							
UF_1	0.201						
UF_2	0.213*	0.791**					
UF_3	0.216*	0.821**	0.791**				
CP_1	0.167	0.125	0.388**	0.361**			
CP_2	0.308*	0.070	0.025	0.063	0.724**		
CP_3	0.201*	0.844**	0.941**	0.870**	0.253	-0.032	

*p<0,05, **p<0,01

UF (Usage Frequency) 1,2,3: Reference and Results, Seeking information about patients, Bureaucracy affairs, CP (Performance of clinical work tasks) 1,2,3: Seeking information about patients, Reference and seeking information, Bureaucracy affairs

Table 5. Correlation between satisfaction factors of EHR usage and global assessment of EHR.

	Sa_1	Sa_2	Sa_3	Sa_4	GA_1	GA_2	GA_3	GA_4	GA_5	GA_6
Sa_1										
Sa_2	0.881**									
Sa_3	0.720**	0.678**								
Sa_4	0.844**	0.808**	0.705**							
GA_1	0.262**	0.215**	0.269**	0.239**						
GA_2	0.690**	0.619**	0.628**	0.665**	0.416**					
GA_3	0.515**	0.412**	0.647**	0.504**	0.337**	0.625**				
GA_4	0.508**	0.384**	0.648**	0.472**	0.299**	0.636**	0.920**			
GA_5	0.507**	0.393**	0.582**	0.444**	0.392**	0.553**	0.723**	0.726**		
GA_6	0.698**	0.678**	0.616**	0.729**	0.447**	0.805**	0.587**	0.570**	0.650**	

*p<0,05, **p<0,01

Sa (User Satisfaction) 1,2,3,4: Content, Accuracy, Easy to use, Timeliness, GA (GlobalAssessment)1,2,3,4,5,6: Timeandeffort, Satisfaction, Departments' performance, Personal performance, Quality, Overall success.

Another significant problem regarding the use of the EHR is the fragmentation of the computerized systems that exist in our country, except for the e-prescription system which is compulsory. Moreover, the EHR cannot be used by other healthcare professionals. All the burden of integrating the information falls onto the Family Physicians, so saving time and resources is not feasible. The lack of integration with other healthcare facilities (hospitals, clinics, laboratories) leads to data not being directly recorded and possibly loss of information.

Following the corrective actions to optimize the EHR application and broaden its use, as well as ease the aforementioned factors, follow-up research should be carried out to confirm the results of the interventions as indicated for quality improvement.

CONCLUSIONS

1. Currently, EHR use is limited and used only in Greek Primary Care. Most participating doctors have stated in several sentences that they are not using the EHR for the actions mentioned in the questionnaire.
2. Doctors who use the EHR reported a moderate satisfaction, so there is still room for improvement.
3. EHR do not have clinical decision support built in, thus compromising important aspects of functionality.

CONFLICT OF INTERESTS

Authors have no conflict of interests to declare.

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